



Joint Service Solvent Substitution (JS3) Working Group



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Wayne Ziegler, ARL



**Joint Service
Solvent Substitution
Working Group**

- “Standard Protocol for Selecting General Cleaning Agents and Processes” Oct 1996
- “Performance Test of ChemFree Enzyme-Based Aqueous Solvent”, Feb 1999
- “Armed Services Test Protocol for Alternative Cleaner Performance Validation” May 1999



- “USN/USMC Aqueous Weapons Cleaner Test Protocol”, February 2000



Observations & Lessons

Selecting An Alternative Cleaning Process

- Misinformation Abounds and Therefore Education is Critical
- Cleaning Must Be Evaluated as Part of a Process – Not a Stand Alone Operation
- Know Your Process & Define Your Requirements (Not the Performance of Your Current Cleaner)

Evaluating Alternative Cleaning Processes

- Some Criteria Are Difficult to Use in Evaluation or Did Not Allow for a Full Indication of Results
- Procurement of Test Coupons Can Be a Bottleneck
- It Is Difficult to Identify Methods for Evaluating Properties Like Cleanliness and Odor
- There Is a Uncomfortable Balance to Maintain Between Technical Requirements & Economic Realities

- Microbial Bio-Remediating
- Aqueous Alkaline Cleaner with d-Limonene
- High Pressure Steam Cleaner

2001 P2 Conference:
Charles Sokol

NAVAL FACILITIES ENGINEERING SERVICE CENTER

- From discussion at Solvent Substitution Workshop → Joint Service Solvent WG
 - Wayne Ziegler (ATC)
 - Andy Del Collo (NAVFAC)
 - Debora Meredith (AFMC)
 - Gerry Mongelli (CTC supporting AFMC)
 - Dr. Katherine Ford (NFESC)
 - Dan Verdonik (representing AAPPSO & DoD NESHAP Subcommittee)
- “largest contribution of HAPs at DoD facilities stems from hand wipe cleaning with solvents”

- Across services 30-35% of P2 needs are related to cleaning applications
- “Increasing compliance requirements causing major impact to manufacturing and maintenance operations” Focus on Cleaning, *Policy and Strategy for Seeking Common Solutions*, Chairman JGPP
- DoD has focused on regulated chemicals, waste management & VOC reductions not HAPs
- 55 DoD Installations are Major HAP Sources
- Multiple NESHAPs may apply to the same system
- Cleaning & repainting technologies have the greatest potential to significantly reduce NESHAP burden



Joint Service Solvent Substitution Working Group

Communication
Collaboration
Coordination



- **Methodology**
- **Information Exchanges**
- **Project Coordination**
- **Project Database**



Targeted Processes

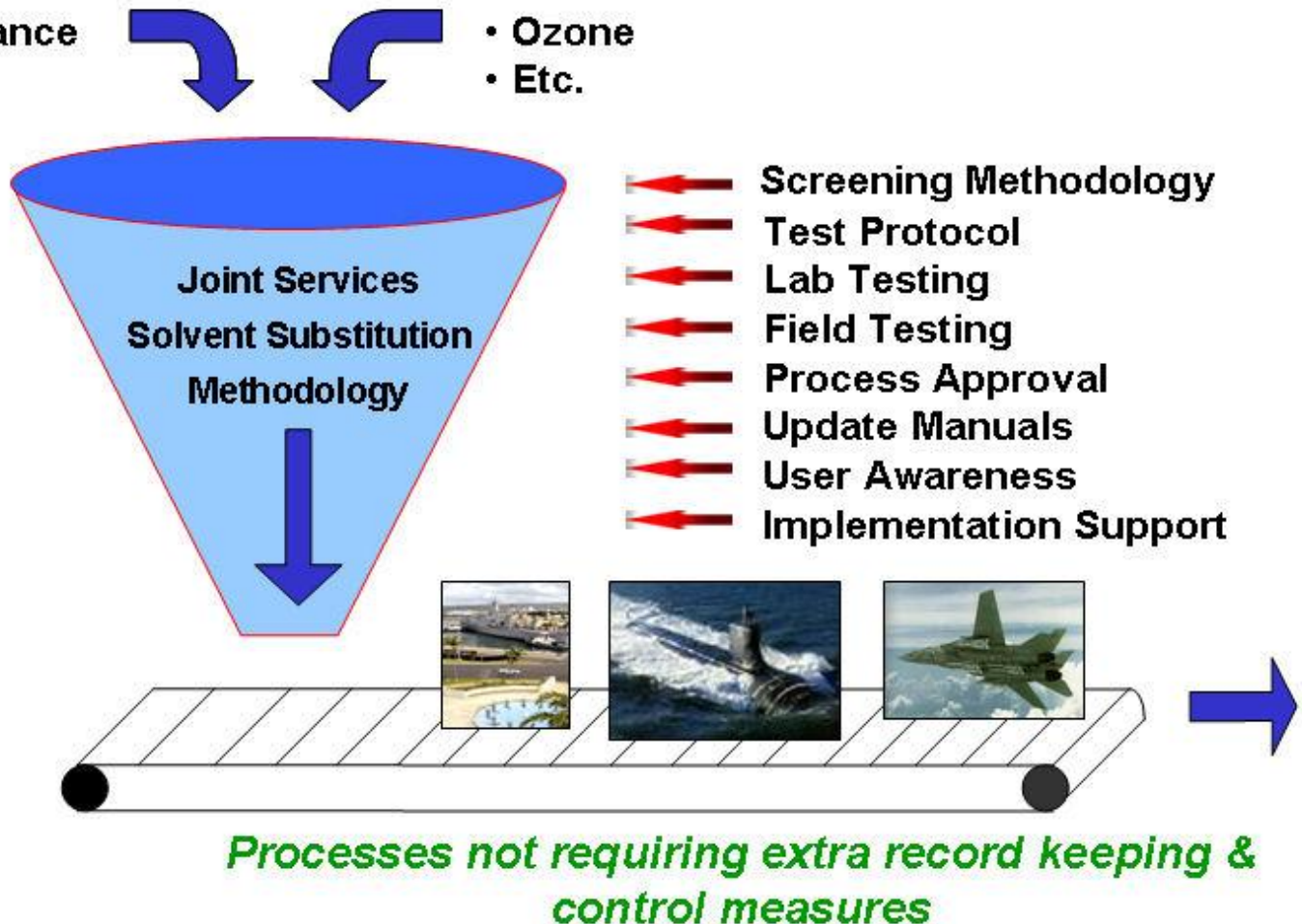
- Aircraft Maintenance
- Ship Maintenance
- Facility Maintenance
- Etc.

Candidate Solutions

- Aqueous Solvents
- Biobased Solvents
- Ozone
- Etc.

Partners

- NAVSEA
- NAVAIR
- Marine Corps
- Army
- Air Force
- NASA



Requirement

Targeted Processes

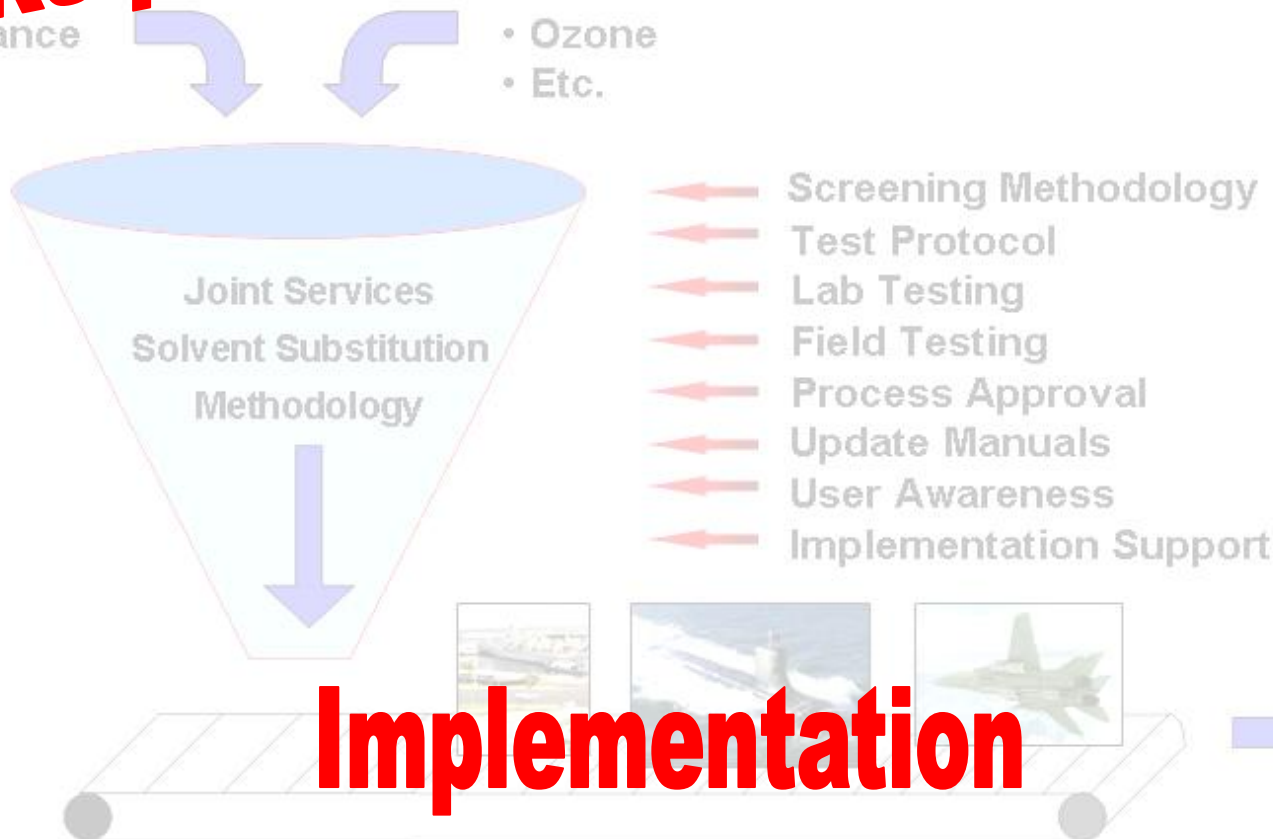
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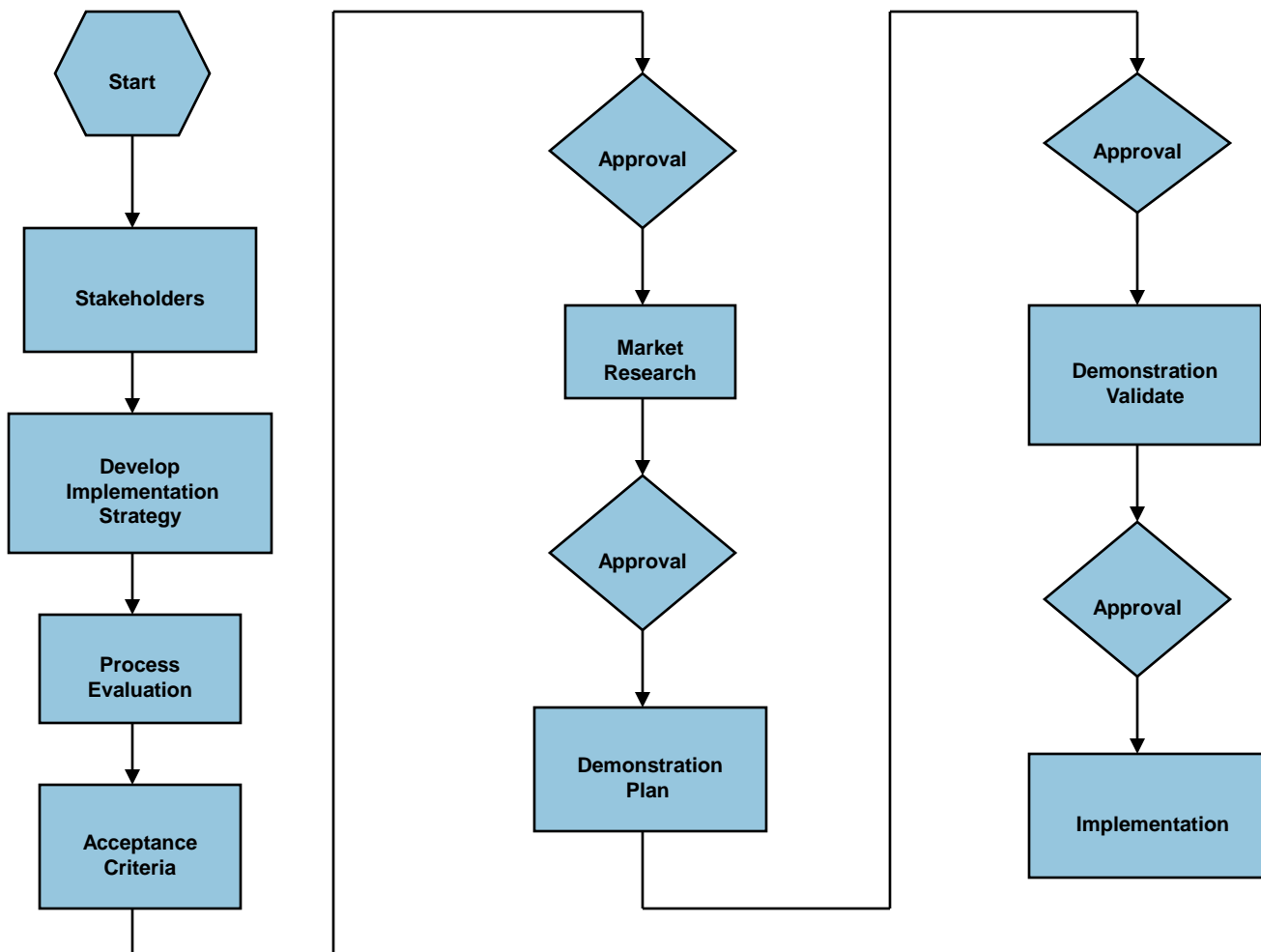
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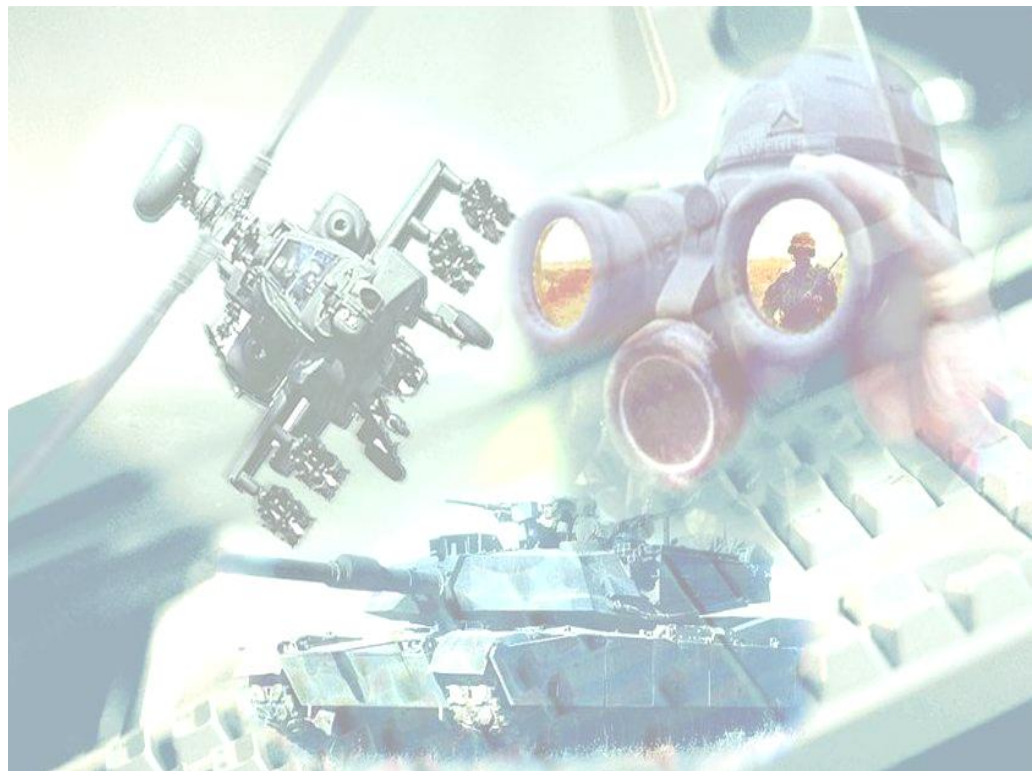


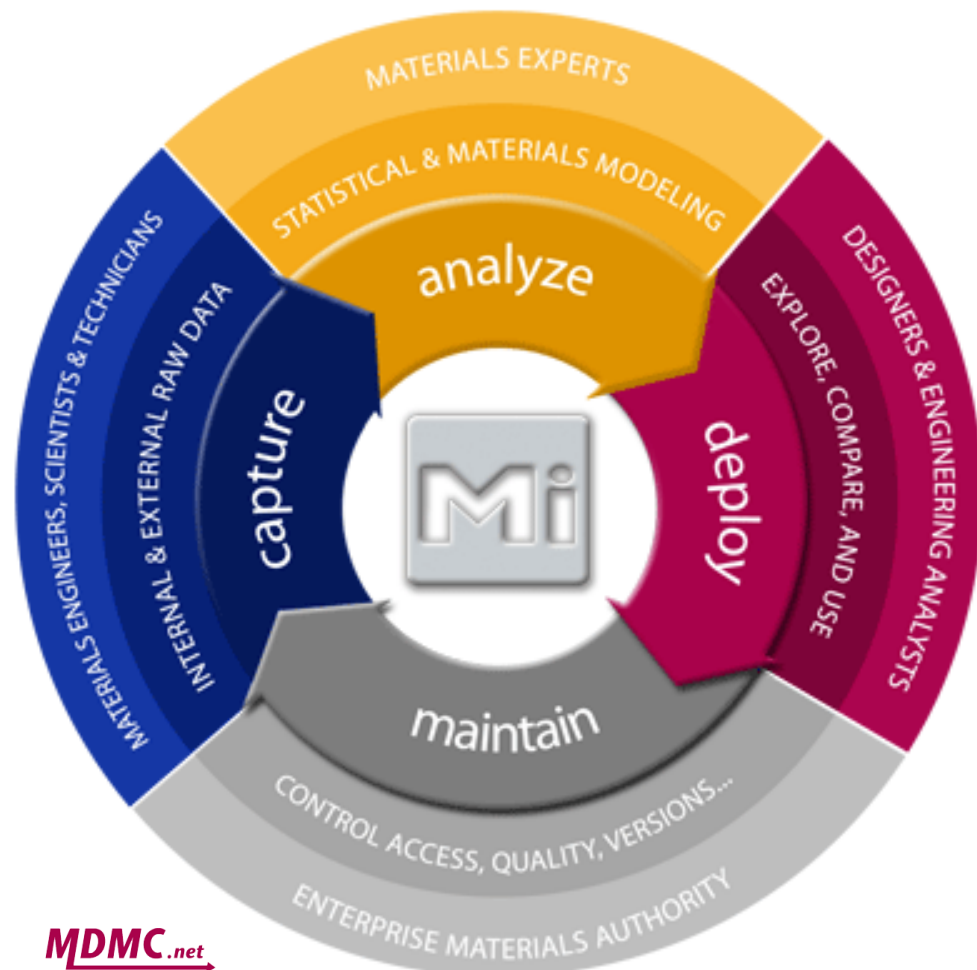
Processes not requiring extra record keeping & control measures

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- All cleaning applications are not equivalent
 - Define the cleaning process
 - Regulations continue to evolve
 - Focus on capability and cost



- Define performance
- Pursue the possible
- Focus on implementation
- Engage the user & understand their perspective
- Grow champions





- Unbiased data **capture** workflows
- Independent **analysis** protocols
- Data **deployment** for multiple SMEs:
 - materials research
 - analytics development
 - simulation validations
 - engineering solutions
- **Maintenance** allows to be source of Quality feeder data for:
 - ICME
 - RDECs
 - Mil spec development
 - LCA
 - proposal writing

It is of limited use, having a superb system to capture & analyze materials data if the resulting information is never deployed to & used by the designers, engineers & PMs that need it.

- 2007 NDCEE Project – HAP-Free Vapor Degreasing for Critical Weapons Systems Applications (AERTA 3.1.a)
- SPOTA/NDCEE Anniston Army Depot Dem/Val

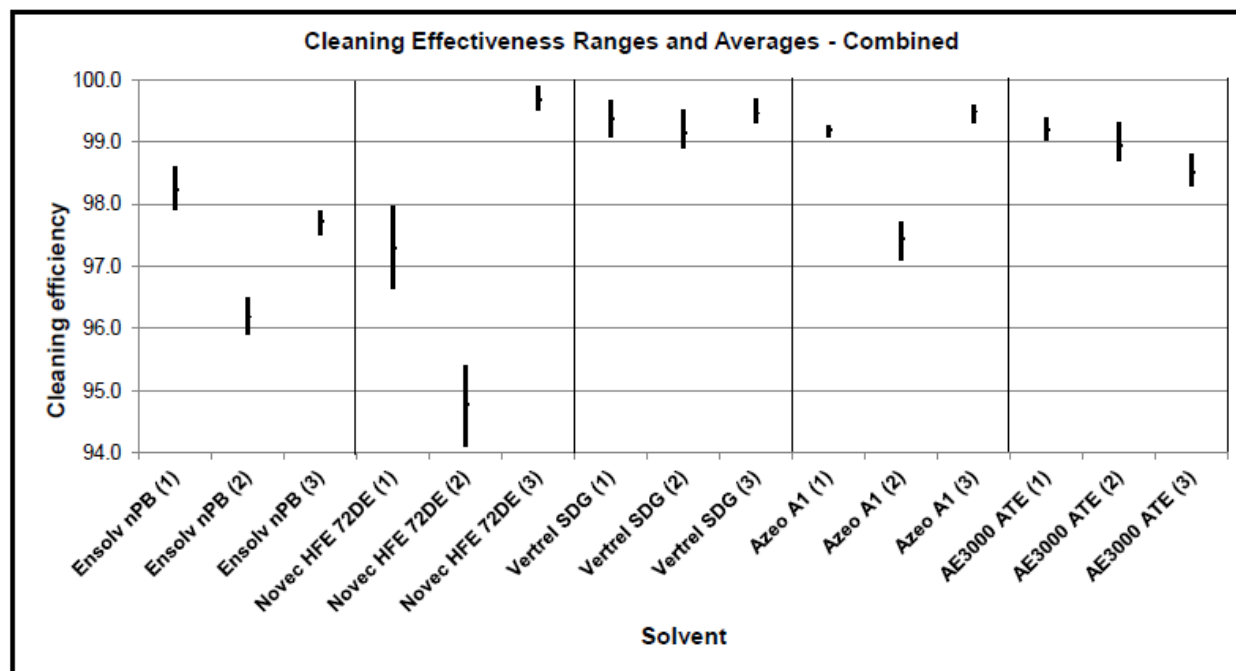
Ultrasonic system
solution

- Small arms
- Wax removal



- Requirement for vapor degreasing alternative – not alternative technology
- RDECOM nPB alternatives Lab scale demo

– Conducted
at NASA
Marshall





Awareness – Presentations and Publications



- Process Cleaning
 - 2006; Efforts of DoD Services and NASA Towards Green Cleaning Operations
 - 2010; Environmentally Responsible Cleaning Processes for Military Applications
- CRC Handbook on Critical Cleaning
 - Ed. 2, Vol. 2 Implementation of Environmentally Preferable Cleaning Processes for Military Applications (2011)

MIL-PRF-32395 Cleaner, General, for Military Systems, Low or Exempt VOC, HAP-Free

MIL-PRF-32405 (MR)

DRAFT PERFORMANCE SPECIFICATION

CLEANER, HAND WIPE, FOR AVIATION and MISSILE SYSTEMS, METALLIC SUBSTRATES, LOW OR EXEMPT VOC

This specification is approved for use by the Department of the Army and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers hand wipe cleaners that do not contain hazardous air pollutants (HAP) (Clean Air Act 112(b)) and contain a low content of volatile organic compounds (VOC) or an exempt VOC (40 CFR 51.100) for use on aviation and missile systems.

1.2 Classification. The cleaners are of the following classes, types, and grades (see 6.2).

1.2.1 Classes.

Class 1. Aqueous (contains water).

Class 2. Non-Aqueous, Non-Halogenated Solvents.

Class 3. Non-Aqueous, Halogenated Solvents

MIL-PRF-32405



Army SPOTA Solvent Program



- Laboratory screening
- Demonstrations
 - Anniston
 - Corpus Christi
 - Letterkenny
- Small Program Award

- SERDP – Cleaning with Ionic Liquids
- ESTCP – nPB Vapor Degreasing full scale demonstration

- Role
 - Provide tools
 - Expertise
 - Collaboration
- Clearinghouse for challenges and solutions
- Mitigate risk by informing decision makers